REMARKS

Reconsideration of the above-identified patent application in view of the remarks following is respectfully requested. Claims 1-9 and 11-14 are pending in the application. Claims 1-9 have been rejected. The rejection of claims 1-9 is respectfully traversed. Claims 11-14 have been allowed. The allowance of claims 11-14 is gratefully acknowledged.

The above-mentioned patent application discloses dynamic bandwidth allocation and queue management methods and algorithms in an Ethernet passive optical network (EPON). The methods are designed to avoid fragmentation loss and guarantee that a length of a grant issued by an OLT will match precisely the count of bytes to be transmitted by an ONU. The methods include determining an ONU uplink transmission egress order based on a three-stage test, and provide various embodiments for ONU report threshold setting. Fragmentation is eliminated while prioritization of a queue is kept.

§ 103 Rejections

Claims 1, 4-8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kramer et al. (US 6,546,014) in view of Patrick (US 200510175014). The rejection is respectfully traversed.

Kramer et al. disclose (Abstract) an optical access network and method for transmitting optical data in the network utilizes an interleaved polling scheme to efficiently use the available bandwidth of the network. The use of the interleaved polling scheme allows a central terminal of the network to dynamically allocate upstream bandwidth from remote terminals of the network to the central terminal in response to the amount of data that is waiting at the remote terminals to be transmitted to the OLT. The allocation of upstream bandwidth is on an as needed basis, so loss of bandwidth due to unfilled time slots is substantially eliminated.

The Examiner's position is that Kramer et al. disclose all the limitations of step (a) in claim 1, but that Kramer et al. do not disclose the handling of fragmentation as recited in step (b). The Examiner then states that Patrick discloses all the limitations in step (b): "based on said grant, calculating a packet egress order

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that eliminates packet fragmentation". The Examiner's position is that it would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the system of Kramer et al. by using the features, as taught by Patrick, in order to provide a simple and effective algorithm (hierarchical prioritized round robin scheduling) for handling overbooked classes (see Patrick sections 0005-0016). Applicant respectfully disagrees.

Fragmentation is a very specific problem of passive optical networks and specifically of uplink transmission of optical network units in such networks, as stated in the present specification:

> [0005]: One of the key causes for low bandwidth utilization is the packet fragmentation loss. A fragmentation loss occurs when a grant does not match precisely the amount of bytes to be transmitted by the ONU. An ONU is not allowed to fragment packets, causing the remaining portion of a grant to be wasted.

The essence of the packet fragmentation is derived from the special PON environment defined by the specific PON TDM uplink transmission mechanism, which defines special slots for transmission according to grants from the OLT. Each ONU transmits its data according to a respective grant. The mechanism to avoid the fragmentation includes fitting the scheduled data in an exact manner inside the respective grant, which removes the need to fragment a packet (which is not allowed in the PON). The subject is thoroughly described in detail in the present specification in paragraphs 0009, 0010, 0012, 0030 and 0031.

Applicant submits that Patrick does not deal at all with passive optical networks, elements of such networks, or fragmentation. None of these features are even mentioned in his specification. Instead, Patrick discloses, in a general communication network, a quality of service (QoS) egress mechanism which considers a guaranteed bandwidth allocation for each flow and provides a mechanism to allocate the rest of the bandwidth to best effort traffic of the rest of the flows. While providing general scheduling, this mechanism is absolutely not suitable to handle the fragmentation problem specific to PONs.

MPEP 2143.03 makes clear that: "To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." The Examiner has failed to meet this burden. Although the recent Supreme Court decision in KSR

International Co. v. Teleflex Inc. et al, 550 U.S. __ (2007) has relaxed the "TSM" test for combining references, it made no change in the requirement that all claim limitations must be taught or suggested by the prior art. The Supreme Court noted with approval In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006), which stated that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."

Since neither Kramer et al. nor Patrick actually teach all the claim limitations, it appears to be the Examiner's position (although not stated explicitly in the Official Action) that it would have been obvious to a person of ordinary skill to provide a method for transmitting packets by an ONU in a PON comprising the steps of receiving a grant having a grant length from an optical line terminal (OLT) of the PON and based on said grant, calculating an ONU packet egress order that eliminates packet fragmentation. The Examiner, however, has not even made a conclusory statement to this effect, let alone providing some articulated reasoning or rational underpinning to support his legal conclusion. In the absence of such a statement, Applicant respectfully submits that the Examiner has failed even to state a case of prima facie obviousness.

Dependent claims 4-8 include all of the limitations of independent claim 1. Applicant respectfully submits that Examiner has similarly failed even to state a case of prima facie obviousness for any of these claims, for the reasons stated above.

Claims 2, 3 and 9 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kramer et al. (US 6,546,014) and Patrick (US 200510175014), further in view of Shi et al.(US 2003/0179769). The rejection is respectfully traversed.

Shi et al. disclose allocation of upstream bandwidth in an EPON through use of a superframe having a number of subframes arranged in a two-dimensional array, wherein for normal data transfer subframes are allocated to each ONU column by column, left to right, and within each column subframes are allocated from top to the bottom. The only reference to fragmentation (except for an irrelevant mention in the Background) is in paragraph 0020:

> *Each superframe may be viewed as having a number of frames, with each frame having a number of subframes that form a row of a two-dimensional array, wherein the optical line terminal (OLT) receives the*

superframe one frame (i.e. one row) after another. In some embodiments, subframes in each superframe are allocated to an optical network unit (ONU) column by column, left to right, and within each column subframes are allocated from top to bottom. Such a systematic allocation of non-adjacent subframes to an optical network unit (ONU) <u>avoids fragmentation of the superframe if a reverse procedure is followed for deallocation</u> (e.g. if deallocation is also done column by column from right to left, and within each column from bottom to top)

The term "superframe" is not an EPON standard term, columns are not mentioned in the EPON standard, and "systematic allocation of non-adjacent subframes" is an <u>OLT</u>, not ONU feature. Clearly, Shi et al. (like Kramer et al. and Patrick) do not perform "calculating an ONU packet egress order that eliminates packet fragmentation", a key feature recited in claims 2-9. There is nothing in Shi et al. that deals with an <u>ONU packet egress order</u> at all. Therefore, the combination of Kramer et al., Patrick and Shi et al. similarly fails a *prima facie* test for obviousness, because neither reference teaches a key limitation of the invention claimed in these claims and because the combination of the three references does not teach all of the limitations of any of the claims. Consequently, Kramer et al and Patrick in view of Shi cannot and do not render claims 2-9 unpatentable. Specifically:

Claim 2: Neither Kramer et al, nor Patrick nor Shi et al. teach a step of calculating an ONU packet egress order that eliminates packet fragmentation. *Mutatis mutandis*, neither reference teaches wherein in claim 1 the step of calculating is preceded by a step of handling out of band information, and includes handling a sub-queue of a given priority.

Claim 3: Neither Kramer et al, nor Patrick nor Shi et al. teach a step of calculating an ONU packet egress order that eliminates packet fragmentation. *Mutatis mutandis*, neither reference teaches wherein the handling in claim 2 includes checking the sub-queue for ungranted packets, and wherein the step of calculating includes performing a three stage test on each of the ungranted packets, each of the stage tests involving a stage variable.

Claim 9: Neither Kramer et al, nor Patrick nor Shi et al. teach a step of calculating an ONU packet egress order that eliminates packet fragmentation. There is no notion of threshold in Kramer et al. at all. *Mutatis mutandis*, neither reference teaches wherein in claim 7 the values of bytes below threshold and total bytes are accumulated from highest to lowest priority.

In view of the above remarks it is respectfully submitted that claims 1-9 are now in condition for allowance in addition to allowed claims 11-14. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

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